Aquaculture Roundtable Consultation

Charlottetown, Prince Edward Island
June 24-25, 1996

"Academia and Industry Working Together in Aquaculture"

Atlantic Veterinary College/University of PEI
Charlottetown, PEI

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Academia and Industry Working Together in Aquaculture

Roundtable Dialogue Session
Charlottetown, Prince Edward Island
June 25, 1996

Summary Report

Introduction

This document is a brief review of the dialogue which transpired at the Roundtable Session, entitled *Academia and Industry Working Together in Aquaculture*, held at the Atlantic Veterinary College, University of Prince Edward Island, on June 25 ,1996. The session was intended as a forum for exchange of ideas and opinions regarding the direction of aquaculture in Atlantic Canada, particularly as applied to research and development for new products and services, better methods of growing aquatic animals, and sustaining viability of aquaculture in the region. The primary purpose was to gain understanding about the views of other constituents through consideration of the major issues currently facing the aquaculture industry and the scientific support for that industry.

The participants were invited from the four Atlantic provinces. The provincial governments of P.E.I., New Brunswick, and Newfoundland were represented (Nova Scotia declined the invitation), as well as the federal Department of Fisheries and Oceans. Among the attendees, there were eleven individuals from the aquaculture private sector, including finfish and shellfish, twelve academic representatives, and ten ACOA observers. The session was co-chaired by Jim Bellamy (Atlantic Veterinary College, UPEI) and Martin Abrams (ACOA).

The session began with the keynote address by Dr. Gerald Johnson, A.V.C. / U.P.E.I., which presented an overview of aquaculture in the region during the evening of June 24, followed by a reception and dinner. Opening presentations by an industry representative (Bill Robertson, Connors) and an academic representative (Brian Ives, Technical University of Nova Scotia) provided perspectives on the strengths and opportunities for aquaculture R&D in Atlantic Canada (see Appendix for presentation summaries). The remainder of the morning was used for discussions about the challenges and constraints to long-term success for aquaculture. The afternoon sessions were used for discussion regarding the actions required to capitalize on the region's aquaculture strengths and opportunities.

Discussion Issues:

The following issues were discussed at various times during the roundtable session. Many of the issues were not considered in isolation during the discussions but were an integral part of other issues.

1. The Costs of Research

Basis for discussion:
Funding for both basic and applied research has been reduced over the past few years. Strategies for funding research must be well planned with both industry and academic input.

Roundtable Discussion Summary:

This general issue was raised several times during the discussions in various contexts. Funding considerations were part of most, if not all, primary issues presented. The consensus was that our collective resources are shrinking and therefore it is more difficult to justify financial commitments to research and development. The industry representatives believed that more R&D activity should be focused on their immediate needs and funding decisions must be practical and results oriented. However, there was also a feeling that when profit margins are smaller, as experienced in the aquaculture industry of late, industry partners cannot be asked to fund a greater and greater part of research and development costs. Consequently, it appears to many academics and government representatives that industry is less committed to investing in R&D when they should be investing in the future.

Industry continues to be committed to R&D and expect more, not less, financial support from government agencies for these projects. The resources dedicated to R&D in the region was considered by many at the meeting to be less than desired for sustained growth of aquaculture. R&D is often seen by companies as an expense, not an investment. The benefits of R&D are realized over the long-term and frequently involve an element of risk some of which the industry must bear. However, a single farm will not benefit as much as the industry in general from many R&D projects.

2. Regulatory Constraints

Roundtable Discussion Summary:

The regulatory process applied to aquaculture in Atlantic Canada is seen by industry as an

obstacle to advancement of aquaculture. This point was discussed by a number of participants. The traditional Department of Fisheries and Oceans (DFO) mandate to protect the marine environment and stocks overshadows the responsibilities toward aquaculture. The economic return from aquaculture is now far greater than from equivalent investment in traditional fishery. Re-balancing of DFO approach to aquaculture is warranted. The provincial boundaries require harmonization regarding aquaculture regulation. Industry requested that a study be undertaken to examine the constraints to aquaculture development with an emphasis on the regulatory framework.

3. Long-term Nature of R&D

Basis for Discussion: Crises management.

A solution to a production problem from scientists is often delayed due to the time involved in defining the problem and writing proposals. Consequently, some on-farm ingenuity is required to combat the immediate production problem. Farmers who demand support from the scientific community are frustrated that practical solutions are so delayed and difficult to achieve when dealing with academics. Industry feel that the researchers are frequently doing "emergency" long-term planning when they should be doing long-term planning for potential emergencies. The diversity of opinions within the industry as to priorities for R&D make long-term strategies difficult. Short-term R&D strategies predominate and this does not foster long-term success.

Roundtable Discussion Summary:

Long-term planning is difficult in such uncertain economic times for aquaculture when risk taking is avoided more than usual. R&D funding by industry partners is one of the first expenses to be eliminated in times of fiscal restraint.

There was a general opinion from academics that the R&D funding for farm-related problems was not consistent, nor sufficiently long-term, to permit research programs to be established and maintained. Many academic rewards are placed on the training and education of graduate students who require secured funding for a two to five year period to complete their degrees. The industry benefits from graduate student involvement through completion of the specific research project with the supervising scientist *and* by having a trained scientist available to the industry. NSERC (National Science and Engineering Research Council) has been a primary source of funds for industry-related R&D in the past but it was generally agreed that another funding mechanism is necessary for rapidly responsive R&D programs for aquaculture.

Regionally, aquaculture is comprised of a collection of many smaller producers and a few larger corporations. Compared to larger companies controlling large budgets, small producers are less able to dedicate funds to R&D projects since most are focused on surviving day to day. Research projects must be focused on solving the immediate problems of smaller producers for it to be worthwhile to divert funds to R&D.

4. Company versus Group R&D Projects

Basis for Discussion: Who benefits

R&D projects require corporate sponsorship. Benefits for the sponsoring company must be proven and remain with the company. Most R&D in aquaculture benefits the entire industry, not just the sponsor. Making the individual farms less willing to contribute financially to R&D because the farm cannot maintain a competitive advantage with the new knowledge. Associations exist in part to permit industry-wide R&D to be carried out and to be delivered back to the entire industry. The associations consist of many different interests, therefore, R&D projects can never expect to have complete support with all members.

Roundtable Discussion Summary:

Small businesses need to group together to form a critical mass and develop proposals for long-term solutions. It was proposed that one of the ways for the funding agencies, or ACOA, to support the aquaculture industry is to assist in developing methods for a collection of small companies to gain some of the advantages of larger corporations.

There is potential for aquaculture companies to work together and fund research that benefits all involved. However, establishing a marketing campaign alone has been very difficult, partly due to the fact that R&D is considered an expense rather than an investment. Since aquaculture, particularly salmon culture, is an extremely volatile industry, individual companies are not prepared to share their knowledge or participate in shared projects. This can present problems when funding agencies require *all* companies to participate. Forming new groups each time a R&D project is proposed would be impossible and farmer associations must accommodate the various viewpoints of *all* members. Aquaculture R&D may be too underdeveloped to expect companies to identify specific projects which would help them more than help the industry as a whole. Generally, farmers do not want to financially contribute to the benefit of the other farms.

5. Results Oriented Research

Basis for Discussion: Results, not Process

Industry associations, academia, and government all contain various levels of bureaucracy. There is tremendous effort and resources wasted trying to complete industry-oriented R&D. Appropriate incentive and reward systems should exist for promotion of efficient R&D programs in the region. Industry participation is discouraged if the R&D process takes precedence over results.

Roundtable Discussion Summary:

The industry values research results, not process. Industry representatives believed that industry funding will continue to be provided for researchers who have a reputation for obtaining results. Problems within aquaculture occur rapidly and generally require immediate attention to avoid a potential crisis. Standard R&D funding mechanisms require excessively long preparation periods and review processes before a project will occur. Due to the lengthy process involved with R&D, farmers can often solve the problem more efficiently, time wise but perhaps not optimally. Consequently, the industry needs projects that will provide *results* in less than 12 months as opposed to waiting to have a project start in 12 months.

To improve the relationship between scientists and industry, an incentive system in the academic community is necessary and the "publish-or-perish" philosophy should be abandoned. Promotion and tenure must include industry "service" as an important component of the reward system for professors. The "chair" system at UNB was proposed as a model to direct research efforts to industry priorities and channel industry contributions to fund research.

6. Service

Basis for Discussion: Service means different things in academia and industry

"Service" referred to the business approach to R&D which is often lacking in aquaculture R&D. The customer must be satisfied. Academics are addressing important issues before they become short-term crises, however, many academics do not appreciate the "interference" of industry in their research programs. Academics are pursuing R&D which is academically rewarding but which may not seem relevant to the industry community. Industry demands that researchers be responsive to their problems but they [industry] are not willing to fund the entire R&D without substantial public contributions.

Roundtable Discussion Summary:

Service meant different things to academics than it did to industry representatives at this roundtable meeting. The academics believed that their R&D efforts constituted service to the industry. However, R&D had to fit their specific long-term goals. Industry wants R&D to be treated like a business such that, if they are unsatisfied with the results, then a new R&D "team" or project would be sought. Reputations for reliability of results would be part of the appeal of certain proven researchers. Those researchers would see the industry sponsors as "clients" and make efforts to ensure their satisfaction. The business approach to R&D could be possible, but there was general feeling that the R&D strategies might suffer from lack of long-term, systemic planning.

Suggestions were made to bring researchers into more direct contact with the industry. Researchers should be spending more time on aquaculture farms and at industry - academic exchanges. As well, there should be more emphasis placed upon extension service by academics.

7. Rapid Decision Making

Basis for Discussion: Red tape

Academics are frequently requested to divert their research program for an emerging crisis. By the time research funding has been granted, industry considers the "problem" old and "academic". As a result, neither the academic nor the industry are satisfied. New methods of R&D funding which accommodate the rapid emergence of new problems in aquaculture should be investigated.

Roundtable Discussion Summary:

The industry comments reflected a need for continued support from Fisheries and Oceans and ACOA. However, there was general agreement that there is too much red tape and time involved in obtaining funding for industry problems. Once the academic process begins on a current aquaculture problem, the procedures for proposal writing, submission, review, and approval take far too much effort and time to be useful for industry. The industry desires rapid and responsive academic support for issues which it identifies as important.

Although the industry desires rapid and responsive R&D, they frequently lack the ability to make rapid and cohesive R&D decisions. Demanding consensus from industry on funding issues may limit the ability of any system from approving R&D initiatives.

There are always dissenters in any large association, but aquaculture still must devise methods of formulating their long-term *and* short-term R&D strategies while adapting to the rapidly changing farming methods. It was argued that research should be seen as a long term process, not as a "firefighting" measure which is geared up in response to a crisis.

8. Industry Mechanisms for R&D Funding

Basis for Discussion: Sustainable Industry R&D Funds

Industry will always have a more immediate need and plan for funds than investing in R&D, despite its obvious importance. Other industries have devised methods to transfer funds into an industry-directed research program. The aquaculture industry should devise a method to secure R&D funds if they are to have a stronger voice about R&D funding.

Roundtable Discussion Summary:

A system utilized for generating sustainable R&D funds in other food-producing animal industries, similar to the hog producers system, was described. The "Check-off" system in which every pig sent to slaughter results in a pre-determined contribution to an industry-driven research fund was proposed as feasible for aquaculture. The swine industry approves R&D projects with matching funds coming from government. Check-offs are implemented by industry, who, get final approval of all projects.

Research is increasingly devoted to maintaining competitiveness instead of increasing production. A narrow profit margin and high volume with a check-off system would probably be quite consistent with a considerable ongoing research effort, but it's a research effort which is devoted to the survival of the industry rather than extension of the industry.

9. Competition for R&D funds

Basis for Discussion: Cooperation within the region.

Competition exists at many levels of government, industry, and academia. The region is small and needs the cooperation of academics and industry to survive in the global economy. Inefficiencies are more pronounced due to the duplication of effort between competing groups. R&D needs within the region are very diverse and make a unified approach very difficult.

Roundtable Discussion Summary:

According to many participants, DFO should continue to be responsible for provision of research funds. DFO is the lead government agency for aquaculture at the federal level. Aquaculture represents 17% of the value of fisheries output in Canada, but only 3% of DFO resources are devoted to the sector.

DFO has a mandate for research and plays a major role in aquaculture. DFO currently places high priority on funding aquaculture R&D. The funding does not just stay within DFO, but projects emphasize collaboration with other organizations and with the industry.

NSERC has been a source of funds for industry in Atlantic Canada and has figured prominently in aquaculture. If the research is on the cutting edge and long-term, then NSERC will participate. However, if short-term solutions to current problems are the goal, as evident with farmers who are always driven by the most recent issue or problem, NSERC is less likely to participate. Suggestions were advanced to explore the possibility of a type of matching funds approach between industry and NSERC, and possibly NRC and ACOA.

10. Exporting Knowledge

Basis for Discussion: Sharing is not always desired

Industry is frustrated by knowledge derived from Canadian R&D going to competing aquaculture industries in other parts of the world. Academics have always exchanged knowledge with other academics.

Roundtable Discussion Summary:

Industry representatives expressed a frustration that foreign countries have benefited from R&D carried out in Canada but provided to other industries at a much reduced cost. Those industries have gone on to compete directly with our industries (eg. Chilean salmon). This was also a concern to academics since exchange of information with academics in other countries has always been part of the advancement of science. Most of the contributions have either been to underdeveloped countries where the contribution is to an industry that will not compete for years, if ever, or to countries who also share their knowledge with us. The knowledge exchange is usually mutually beneficial.

Conclusions

The aquaculture industry is maturing and requires a greater voice in research and development planning. Funding of R&D, as expected, was a major consideration during these roundtable discussions. Reduction in government support means that industry must pay for a larger component of R&D and yet they feel frustrated by an unresponsive system. The increased emphasis on sponsor funding of R&D projects comes at a time when the industry feels its short-term survival threatened by low profit margins and increasing competition with other countries. Long-term planning and commitments from industry will not be easily attainable. Industry must take a more active role in stimulating R&D in aquaculture.

Academics require long-term funding so that they can build productive research programs but the greatest demand seems to be for R&D projects with immediate results. There is growing competition between researchers for shrinking research funds. Interaction with industry and solving industry problems is not always rewarded by the academic system, nor is it rewarded financially by the industry. There is a growing need to have R&D treated by academics like a business, with the same responsiveness and incentives as business. Academics must take a more responsive role in assisting the industry in aquaculture R&D.

Regulations concerning health and transport of new strains of fish are restricting aquaculture development. Revisions must permit access to healthy fish stocks for reasonable genetic gains.

The research and development occurring in aquaculture in Atlantic Canada is some of the finest in the world. More active coordination between small producers and between producers and researchers must occur for the most fruitful R&D to develop. Dialogue is extremely important to ensuring that we continue to have mutually beneficial relationships between aquaculture industries, academics, and governments.

APPENDIX A

Discussion Paper

Academic and Industry Working Together

Academic and Industry Working Together in Aquaculture

Roundtable Dialogue
Charlottetown, Prince Edward Island
June 25, 1996

Discussion Paper

Background Information on Aquaculture Development in Atlantic Canada:

The Aquaculture industry has developed into an important industry in Atlantic Canada over the past fifteen years. During this period, both the federal and provincial governments embarked adopted policies to promote regional economic development and create employment opportunities in all four Atlantic provinces.

Aquaculture was identified as an industry that could produce new and sustainable employment in Atlantic Canada. The region had a significant number of rural coastal communities within close access to suitable aquaculture sites, there were close potential markets in the U.S. and central Canada, and significant research and development had taken place at the different educational institutions and government research stations across the region.

Since about 1980, development of the aquaculture sector continued with substantial government support coming from Federal - Provincial Development Agreements and other industrial incentive programs delivered directly by both levels of Government.

By 1994, the value of the Aquaculture Industry in Atlantic Canada reached $114 million with a volume of 23,000 tonnes. The major contributor to the industry was New Brunswick salmon which was valued at $91 million although other species such as mussels in P.E.I., and salmon and rainbow trout have had significant impacts in areas of Newfoundland and Nova Scotia.

The sharp decline in the Atlantic commercial groundfish fishery that has taken place over the past number of years has increased the need to create long term sustainable jobs in rural areas of the Atlantic region. This has increased interest in the development of the aquaculture industry. To facilitate this development, the Federal Department of Fisheries and Oceans, in consultation with the Provincial Governments and the industry, developed an Aquaculture Development Strategy that was released last year. Under the Strategy, emphasis will be placed on further expansion of farming the existing species, as well as, a move into new species and the development of value added products.

Potential Focus Issues:

The following issues should be considered as ideas which may be discussed during the roundtable session. This list is not meant to exclude other topics. Please indicate in the attached questionnaire which of these general issues should take priority in the roundtable session and feel free to add other topics which you believe should be addressed.

1. Crisis management.

The solutions to production problems are often solved with some on-farm ingenuity while scientists are still defining the problem and writing proposals. Farmers who demand support from the scientific community become frustrated that practical solutions are so delayed and difficult to achieve. Researchers are doing "emergency" long-term planning when they should be concentrating on long-term planning for potential emergencies.

2. The costs of research

Funding for both basic and applied research has been reducing over the past few years. Strategies for funding research must be well planned with both industry and academic input.

3. Service industries versus production industry.

The aquaculture production capacity of the region will always be small relative to other areas of the world. Despite our limited production, Atlantic Canada has developed some of the most respected aquaculture-related academic and service institutions in the world. Strategies designed to promote the development of aquaculture service industries and export of technology should be cooperatively planned.

4. Cooperation within the region.

Competition exists at many levels of government, industry, and academia. The region is very small and needs the cooperation of academics and industry to survive in the global economy.

5. Communication of Research Results

Results from research and development projects must be applied to the industry if they are going to have any beneficial effect. Aquaculture requires a middle group between researchers and producers which can interpret relevant science and apply it at the farm level (i.e similar to extension specialists for dairy farmers).

6. Product diversification.

Product diversification through production of new species or through new products is necessary to sustain growth. New species, such as halibut, haddock, and flounder, have potential and their

culture methods are currently being developed.

7. Environmental concerns.

The salmon farming industry in Atlantic Canada is a young industry and is yet to prove its environmental sustainability. Protection of the environment is a high priority. Environmentally damaging practices, or the *perception* of damaging practices, may negatively impact public perception of aquaculture. As well, pollution caused by other groups (eg. other industries, sewage) can have severe consequences for the aquaculture industry.

8. Limiting the effects of health on production

Health regulations are required to minimize the risk of introducing new diseases to the cultured and wild fish stocks in the region and to reduce the influence of disease at one farm on neighbouring farms. Academics, industry, and governments must design appropriate health regulations for aquaculture.

9. Marketing issues.

Academics from business fields have not been very involved in aquaculture. More profit can be obtained through innovative or aggressive marketing strategies than through reducing the cost of production. The aquaculture industry requires reasonably priced consulting from business academics to develop marketing plans. Academics should do more research to supply the producers with more business and market information and the industry requires a group to apply the information and skills.

10. Technological enhancement of production.

There is a general perception that science can continue to invent new technologies that will remove constraints to sustained growth in aquaculture. There is a limit to technological reliability that must be recognized. Risk of technological failures increase with greater dependence on technology.

APPENDIX B

An Overview of Regional Aquaculture

Dr. Gerald Johnson

An Overview of Regional Aquaculture

Summary of Keynote Address given by Gerald Johnson

Aquaculture has grown into a major contributor to the Atlantic Canada economy. There is an infrastructure that offers the necessities for intensive production and services for problem solving. The latter is the focus of this presentation since interaction between academia and industry frequently revolves around problem solving.

Growth in Canadian aquaculture is disproportionately small compared to other countries. The world market continues to grow and with the worldwide decrease in wild stocks, opportunities continue to expand. Any one commodity, however, will continue to suffer the ups and downs of supply and demand. Problem solving in this context must be cost effective and long term rather than reactionary to be truly beneficial.

Aquaculture, like all food industries, continues to evolve. During the research phase many research dollars support a small production of a profitable product. Successful research provides more production and technologies are bought and sold to ensure maximum production. As markets are saturated, the price drops requiring research into efficient, high volume, low-cost production. Aquaculture at this point becomes true farming of fish. Alternatives to declining price and profit begin to arise. New technologies ,like off shore cages, or new species (halibut and haddock) represent new industries, and research dollars have to be available on that basis for development to be optimum.

Atlantic Canada has successfully utilized areas for aquaculture but room for development of the inshore is running out. Nova Scotia has more room for steelhead than salmon. Steelhead s a new industry in terms of development strategies: different freshwater growth, seasonal saltwater growth, different brood stock selection, different diseases, etc. Newfoundland has similar untapped opportunity with different geographic considerations. New Brunswick industry is concentrated in a small area and requires new technology to utilize more exposed sites. P.E.I. salmonid industry is hatchery based, inhibited more by regulation than anything else. Each has to be evaluated under which stage of development currently predominates to ensure money, effort, and expertise are effectively utilized. Shellfish have similar species, space, and development concerns with different names on the problems inhibiting their growth.

Marketing must be in step with production. Currently, most product is sold fresh with limited benefit to the Atlantic Canadian community in terms of processing jobs. To invest research and development dollars in production without a balanced effort in market innovation minimizes the economic spin offs of this vital and dynamic aquaculture industry.

Atlantic Canada has a resounding share of talent and expertise. The challenge is to make the best use of it.

An overview of Regional Aquaculture

Ten years in the Making

- Gerald Johnson
- Ex Fish Health Coordinator
- Atlantic Veterinary College
- UPEI

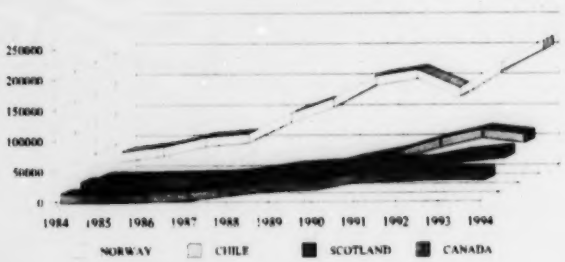
The Overview Perspective

Looking Only at Problems

- Searching Cost Effective Solutions
- Taking the Longterm Approach
- Reassessing Strategies

Farmed Salmon Production Statistics

Metric Tonnes



Percent Canadian Aquaculture Production

	1985	1990	1994
Canada	100	100	100
Norway	1524	746	545
Chile	29	110	180
Scotland	344	152	155

1994 Canadian Aquaculture Statistics

Tonnes

	NB	NFLD	NS	PEI	BC	TOTAL
Finfish	12161	395	734	54	20120	38480
Shellfish	491	412	548	7988	5632	15102
TOTAL	12652	807	1282	8040	25752	53582

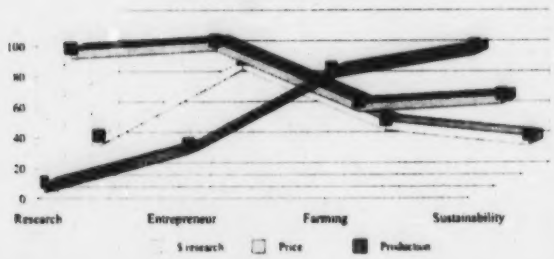
World supply of Fish

Future Projections

		1992	2000	2025
Finfish	Freshwater	7981	12200	24600
	Diadromous	1081	1700	3400
	Marine	356	500	1000
Shellfish	Crustaceans	982	1800	4100
	Molluscs	1390	4900	8900

Evolution of an Industry

General Characteristics



Expansion of Aquaculture

Efficiency vs Sustainability

- Intensification
- Catch the wave
  - New Species
  - New Technology

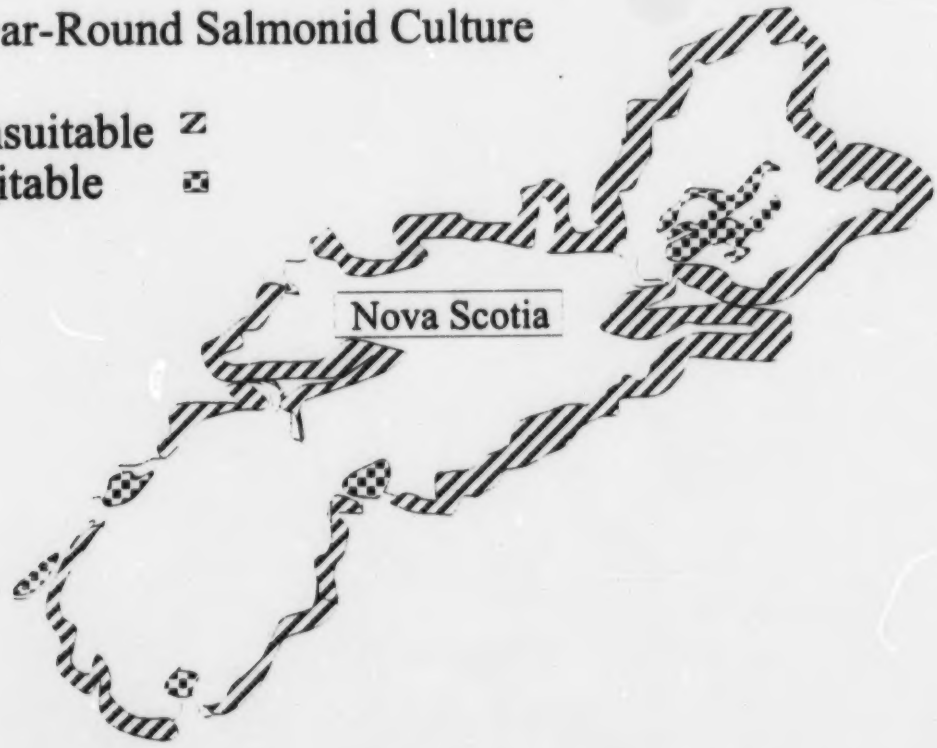
Expansion of Aquaculture

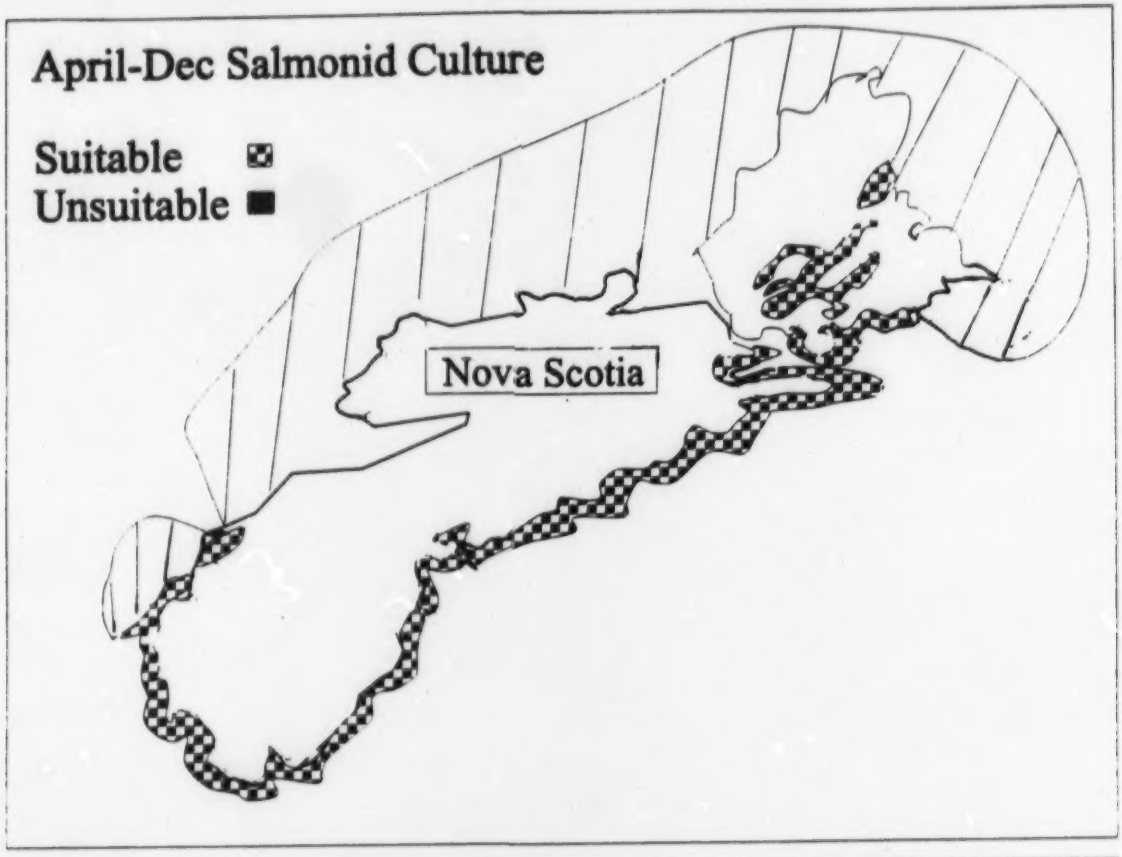
Limitations

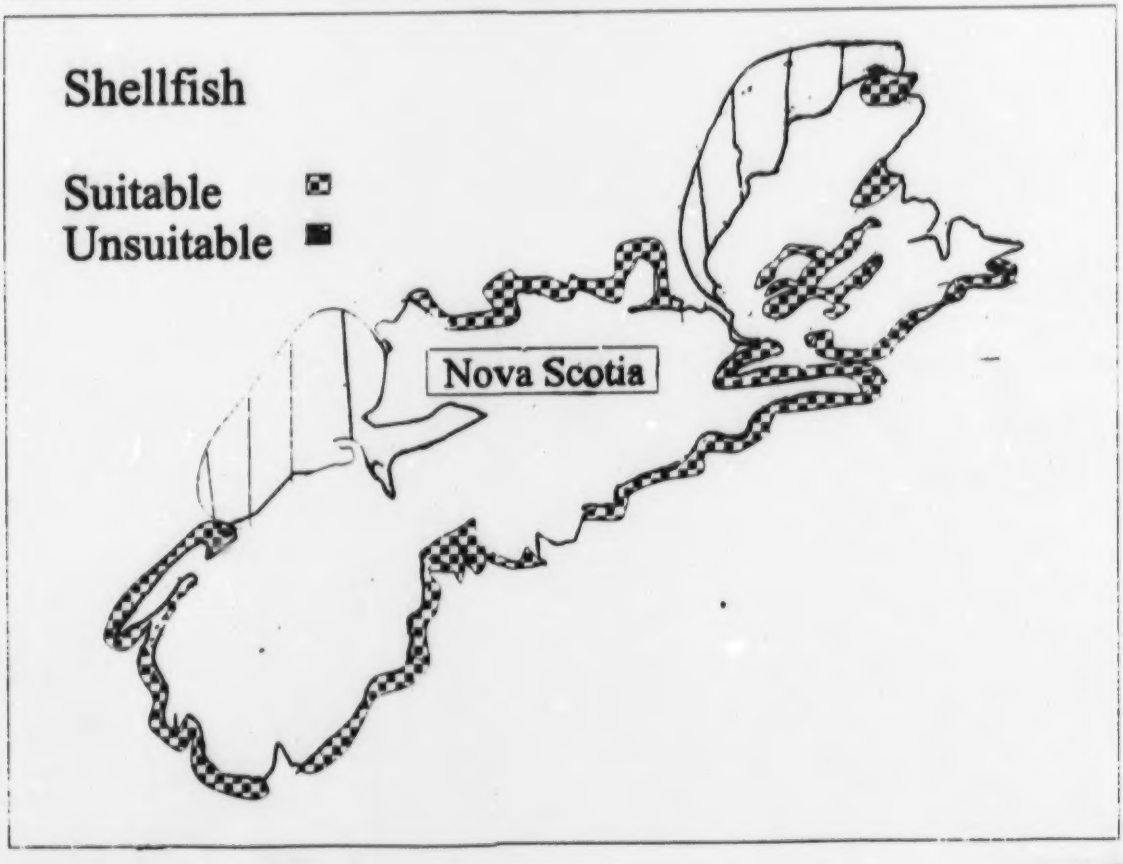
- No More Room

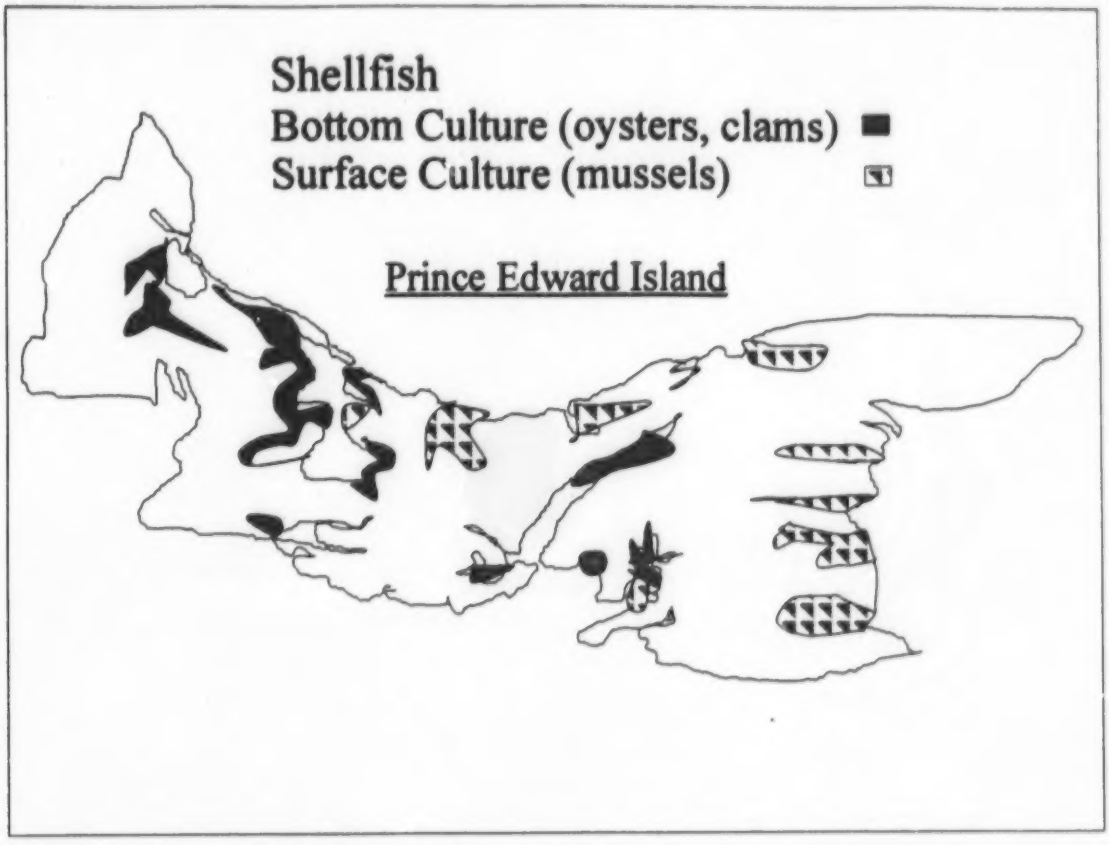
Year-Round Salmonid Culture

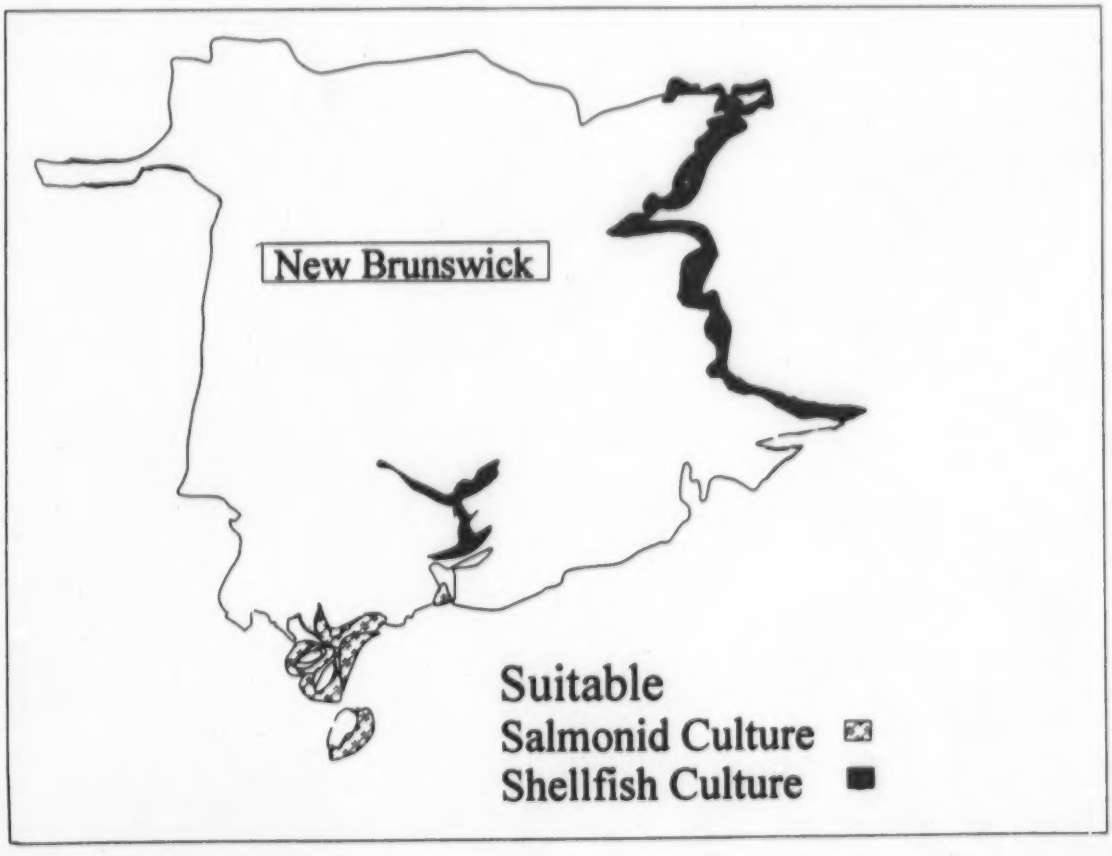
Unsuitable
Suitable




April-Dec Salmonid Culture
Suitable
Unsuitable
Nova Scotia


Shellfish
Suitable
Unsuitable
Nova Scotia


Shellfish
Bottom Culture (oysters, clams)
Surface Culture (mussels)
Prince Edward Island


New Brunswick
Suitable
Salmonid Culture
Shellfish Culture

Expansion of Aquaculture

Efficiency vs Sustainability

- New Species
  - Exotic or Indiginous
- Salt water or Fresh water
- Warm water or Cold

Marketing

Change the Product

- Fresh
  - fast, efficient
  - limited sales points

Marketing

Change the product

- Value Added
  - longer storage, greater diversity
  - separate infrastructure, continuous specific supply

Marketing

Change the product

- Innovation
  - novel markets, price control
  - longterm, risky
  - each a new industry

Aquaculture Future

What do we really want to accomplish?

- Who leads the way?
  - Producers
  - Academics
  - Government
  - Wealth Creation

APPENDIX C

Strengths and Opportunities of Aquaculture R&D in Atlantic Canada

I. Industry Viewpoint - Mr.Bill Robertson

II. Academic Viewpoint - Mr. Brian Ives

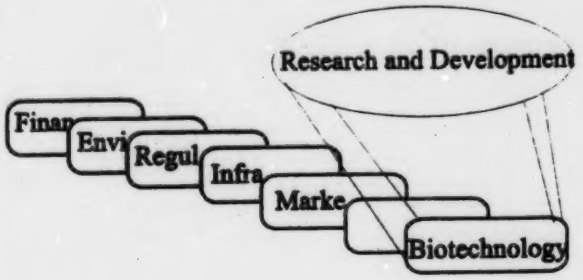
I. Industry Viewpoint

Mr. Bill Robertson

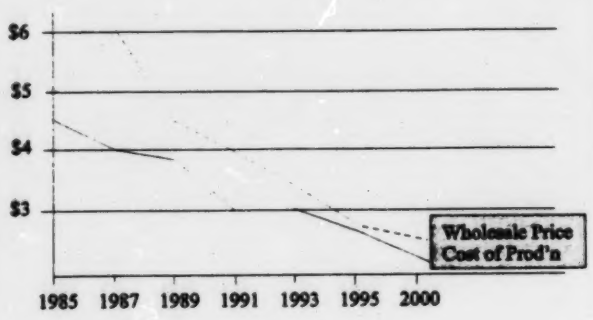
AQUACULTURE ROUNDTABLE ON R&D:
Strengths and Opportunities

	Nor	Chile	UK	US/Can	TOTAL
Hydro Seafoods	50		10		60
Norway Royal			40		40
Marine Harvest		10	25		35
Stolt Seafarm	20	5		8	33
Leroy Group	20				20
Salmocorp		15			15
CBL/BCF				13	13
Terra	10				10
Fjordlaks	10				10
Unimarc		10			10

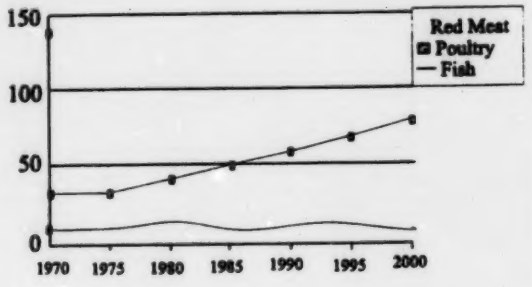
AQUACULTURE ROUNDTABLE ON R&D:
Strengths and Opportunities



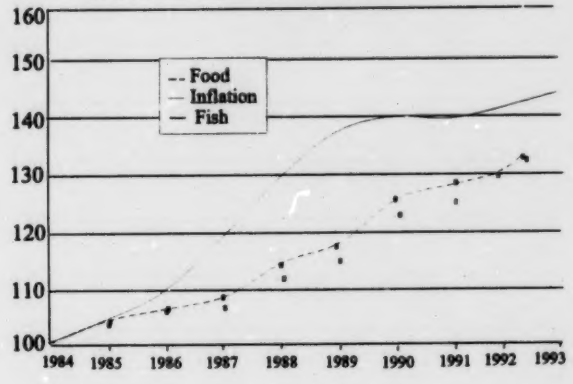
U.S. PRICE PER LB. (WHOLESALE)



U.S. Per Capita Consumption



U.S. Retail Price Trends



Seafood Consumption 1987-1993

(pounds per capita)

Rank	1987	1990	1993	Rank
Canned Tu	3.5	3.7	3.5	1
Shrimp	2.3	2.2	2.5	2
Cod	1.68	1.38	1.03	4
Alaska Poll	0.89	1.27	1.2	3
Flatfish	0.727	0.57	0.623	7
Clams	0.662	0.61	0.589	8
Catfish	0.6	0.7	0.988	6
Salmon	0.428	0.73	0.995	5
Crabs	0.323	0.29	0.375	9
Scallops	0.322	0.3	0.257	10

AQUACULTURE ROUNDTABLE ON R&D:
Strengths and Opportunities

- Health
  - oral vaccines and in-feed treatments
- Growth Rates
  - Species specific diets, feed management
- Feed Conversion
  - new sources of protein, nutrient balance
- End Product Quality
  - Management of texture,colour, fat

AQUACULTURE ROUNDTABLE ON R&D:
Strengths and Opportunities

- We can be significant players
- Aquaculture is a complex Agri-Business
- Our "costs" can be addressed with focused, relevant R&D projects
- We need the continued support for infrastructure development

II. Academic Viewpoint

Mr. Brian Ives

Summary of the Academic View Point by Brian Ives

There are several good scientists in the Atlantic region but [there is a serious mismatch] between the research that is conducted by scientists in Atlantic Canada and what industry needs. Business people have to deal with crises every day. Generally they feel that the original objectives for a project, that they have invested time and money into, may change as time progresses due to changing interests of the researchers. Scientists are able to work with industry but they need to make some fundamental changes in their research approach. One of the challenges may be that we have too many scientists and such a small industrial base. However, there is opportunity for aquaculture in Atlantic Canada based on short-term problems.

We have just reached the point that we consider ourselves farmers in the collect [with science, government, and industry working together]. The scientific community needs to understand that [if they generate wealth with the industries, some of those monies will come back to the institutions]. The goal is to invest in long-term planning that will benefit both sectors.

An important aspect in improving the relationship between the academic and industry communities is to increase interaction between the two. Scientists should invest time in working with industry and subsequently, bring the knowledge they gain back to the classroom to educate the young technicians and scientists about the concerns within the industry.

We need to become more aware of the opportunities in aquaculture in all communities. There is considerable waste in aquaculture that is unfortunate from an economic point of view. We need to focus on byproduct utilization. As well, there is a lack of communication between universities within the region. There is knowledge gained [from the scientific community and universities and all over the world] that could benefit the aquaculture industry. The problem is to learn how to work together [to avoid reinventing the wheel].

As a final comment, the scientific community feels that industry is reluctant to invest in R&D. One approach, for the scientific community to gain industry support, would be to apply the information gained from research over the years to the needs of the industry.

APPENDIX D

Aquaculture Roundtable Consultation
Attendee List

AQUACULTURE ROUNDTABLE CONSULTATION ATTENDEE LIST
JUNE 24-25, 1996

NAME	TITLE	ORGANIZATION	ADDRESS
Government			
Mr. Rory Francis Mr. Louie Creed	Deputy Minister ADM	PEI Department of Agriculture, Fisheries, and Forestry	P.O. Box 2000 Charlottetown, PEI C1A 7N8
Mr. Les Dean	Deputy Minister	NFLD Department of Fisheries, Food, and Agriculture	P.O. Box 8700 St. John's, NFLD A1B 4J6
Russell Henry	Registrar of Aquaculture	NB Fisheries and Aquaculture	P.O. Box 6000 Fredericton, NB E3B 5H1
Dr. Wendy Watson-Wright	Director	St. Andrews Biological Station Dept. of Fisheries & Oceans	St. Andrews, NB E0G 2X0
Dr. Robert Cook	Director	Aquaculture Coordination Office Dept. of Fisheries & Oceans	P.O. Box 550, Station M Halifax, NS B3J 2S7

NAME	TITLE	ORGANIZATION	ADDRESS
Industry			
Dr. Mark Moore	General Manager	Jail Island Salmon	General Delivery St. George, NB E0G 2Y0
Mr. Bill Thompson	General Manager	New Brunswick Salmon Growers Association	R.R # 4, Limekiln Road St. George, NB E0G 2X0
Mr. Bill Robertson	Director	East Coast Operations Aquaculture Division Connors Brothers Ltd.	Blacks Harbour, NB E0G 1H0
Ms. Elizabeth Barlow	President	Salmonid Growers Association - Aquatic Resources Inc.	P.O. Box 36 St Albans, NF A0H 2E0
Mr. Marc Kielley	Executive Director	Newfoundland Aquaculture Industry Association	21 Mews Place P.O. Box 23176 St. John's, NF A1B 4J9
Ms. Marli MacNeil	Executive Director	Aquaculture Association of Nova Scotia	P.O. Box 802, Station M Halifax, NS B3J 2V2
Mr. Paul Neima	President	Aquaculture Association of Nova Scotia, F.R.D.L.	P.O. Box 802, Station M Halifax, NS B3J 2V2

NAME	TITLE	ORGANIZATION	ADDRESS
Mr. Roger Townshend	President	Prince Edward Island Mussel Growers Association	R. R. # 1 Mt. Stewart, PEI C0A 1T0
Mr. Dave Loggie	Atlantic Vice-President	Shur-Gain Maple Leaf Foods Inc.	P.O. Box 1630 Summerside, PEI C1N 2V5
Ms. Sharon Ford	Executive Director	Canadian Aquaculture Industry Alliance	20th Floor 45 O'Connor Street Ottawa, Ontario K1P 1A4
Dr. Rob Armstrong	Executive Director	Salmon Health Consortium	20th Floor 45 O'Connor Street Ottawa, Ontario K1P 1A4
Academic/ Research			
Dr. Andrew Boghen	Professor	Department of Biology	University of Moncton Moncton, NB E1A 3E9
Mr. Bill Paterson	Director	Research and Development Services	University of New Brunswick P.O. Box 4400 Fredericton, NB E3B 5A3

NAME	TITLE	ORGANIZATION	ADDRESS
Dr. John Allen	Executive Director	Huntsman Marine Science Centre	Brandy Cove St. Andrews, NB E0G 2X0
Dr. Bev Bacon	Head Food, Fisheries, and Aquaculture Department	Research and Productivity Council	921 College Hill Road Fredericton, NB E3B 6Z9
Dr. Larry Crim	Director	Ocean Science Centre	Memorial University of Newfoundland St. John's, NF A1C 5S7
Dr. Boyd Smith	Head, School Fisheries	Fisheries and Marine Institute of Memorial University	P.O. Box 4920 St. John's, NF A1C 5R3
Dr. Roger Foxall	Director General	NRC Institute for Marine Biosciences	1411 Oxford Street Halifax, NS B3H 3Z1
Dr. Derek Anderson	Professor	Nova Scotia Agricultural College	P.O. Box 550 Truro, NS B2N 5E3
Dr. Roger Doyle	Director	Gene Probe Laboratory Biology Department	Dalhousie University Halifax, NS B3H 4J1

NAME	TITLE	ORGANIZATION	ADDRESS
Mr. Brian Ives	Technical Coordinator	Canadian Institute of Fisheries Technology Technical University of Nova Scotia	1360 Barrington Street P.O. Box 1000 Halifax, NS B3J 2X4
Dr. Gerald Johnson	Associate Professor	Department of Pathology and Microbiology	Atlantic Veterinary College, UPEI 550 University Ave. Charlottetown, PEI C1A 4P3
Dr. Ian Dohoo	Associate Dean of Research	Department of Health Management	Atlantic Veterinary College, UPEI 550 University Ave. Charlottetown, PEI C1A 4P3
Dr. Jim Bellamy (Co-Chairman)	Coordinator	Graduate Studies and Research	Atlantic Veterinary College, UPEI 550 University Ave. Charlottetown, PEI C1A 4P3
Government Agency			
Mr. Martin Abram (Co-Chairman)	Vice-President	ACOA	Ottawa, Ontario
Ms. Elaine Cooke	Senior Policy Analyst	ACOA	Ottawa, Ontario
Mr. David Slade	Chief Economist	ACOA	Moncton, NB

NAME	TITLE	ORGANIZATION	ADDRESS
Mr. Allan Miller	Project Impimen-tation Officer	ACOA	Moncton, NB
Mr. Geoffrey Allen	Account Manager	ACOA	Charlottetown, PEI
Mr. George Power	Account Manager	ACOA	St. John's, NFLD
Ms. Linda MacDonald	Account Manager	ACOA	Saint John, NB
Mr. Kevin Elworthy	Development Officer	ECBC	Sydney, NS
Mr. Jeff Mullin	Account Manager	ACOA	Halifax, NS
Mr. John Enman	Account Manager	ACOA	PEI
Observers			
Dr. Larry Hammell	Fish Health Coordinator	Department of Health Management	Atlantic Veterinary College, UPEI
Ms. Liz Rostant	Roundtable Consultation Coordinator	Department of Health Management	Atlantic Veterinary College, UPEI
Mr. Bob Johnston	Director	Canadian Aquaculture Institute	Charlottetown, PEI
Dr. David Milne	Professor	Department of Political Studies	University of Prince Edward Island
Dr. Rick Cawthorn	Professor	Department of Pathology and Microbiology	Atlantic Veterinary College